

REMARKS

Claims 1-4, 6-9, 14-17, 22-25, and 30-45 are pending in this application. Claims 1-4, 8, 16, 24, 25, 32, 39, 42, 44 and 45 are amended herein. Claims 5, 10-13, 18-21 and 26-29 are cancelled.

The Objection to the Drawings

The original drawings are objected to in paragraph 1 of the Office Action for the use of the caption Temp (°C). Replacement drawings are provided herein wherein Temp (°C) is changed to Temp (°C). Withdrawal of the objection and approval of the drawings presented in the Replacement Sheets are respectfully requested.

The Objection to the Disclosure

The abstract of the disclosure was objected to in paragraph 2 of the Office Action because of legal phraseology. The Abstract has been amended to correct the informalities. A replacement Abstract is appended hereto as a separate sheet.

The following amendments are made to the specification to correct the informalities set forth in paragraph 3 of the Office Action:

- a) On page 26, line 16 the term “,\$ -unsaturated carbonyl has been amended to read as an α,β -unsaturated carbonyl, as was originally intended.
- b) The tables for Examples 17-20 are replaced without shading.
- c) On page 6, lines 19-22, the paragraph referring to Japanese Patent No. 78155/1995 is deleted.

Additionally, formula (1) at the bottom of page 25 is amended to change $-(\text{SiX}_3)_3$ to $-(\text{SiX}_3)_5$ as was originally intended.

The rejections under 35 U.S.C. 112

Claims 1-45 are rejected under 35 U.S.C. 112, paragraph 2. In particular, independent claims 1 and 42 employ the term “hardness increasing amount”. While applicants submit that the term is not unclear to one skilled in the art, independent claims 1 and 42 have been amended to additionally recite that “the hardness increasing amount is from 1 to 100 phr above the amount necessary to achieve equivalent Shore A hardness of the silica/rubber mixture as compared with the use of bis- (triethoxysilylpropyldisulfide) as the silane.” It is submitted that any lack of clarity has been overcome by the amendment.

Claims 8, 16, 24 and 32 are amended herein to correct the recitation of the Markush group.

Claim 25 is amended to specify that the MQ resin is the one recited in claim 1.

Claim 1 is amended to rename the R groups to exclude any inconsistencies with respect to 5, 13, 21 and 29. A corresponding change is made in the specification at page 20, line 2.

Claim 39 is amended to recite “thermoplastic” resin, which is evident from the mention of high glass transition temperature.

The Rejections under Prior Art

1. Claims 1-24, 33-34, and 42-45 are rejected under 35 U.S.C. 102(b) as being anticipated by Cruse et al. WO 99/09036, (hereinafter, “Cruse ‘036”). Cruse ‘036 discloses a rubber

composition with blocked mercaptosilanes having the same formula as the ones claimed herein.

Claim 1 as amended herein is directed to a method for increasing the hardness of silica/rubber mixtures. A mercaptosilane and a hardness-increasing amount of at least one of the specified members is blended into the mixture wherein the hardness increasing amount is from 1 to 100 phr above the amount necessary to achieve equivalent Shore A hardness of the silica/rubber mixture as compared with the use of bis-(triethoxysilylpropyldisulfide) [i.e., TESPD] as the silane, and wherein the total amount of the member is above 100 phr and up to about 160 phr. A similar amendment is made to claim 42, which is directed to an article of manufacture. Support for the amendment may be found in the specification, for example at page 16 lines 5 to 8, and in the Tables for Examples 11 and 12 which show silica loadings well above 100 phr in conjunction with the use of NXT silane (i.e., 3-octanoylthio-1-propyltriethoxysilane).

Cruse '036 does not disclose or suggest the invention as recited in independent claims 1 or 42. Applicants herein have discovered that there is a reduction in the hardness of silica filled rubber mixtures attributable to the use of mercaptosilanes, particularly blocked mercaptosilanes such as NXT silane which correspond to the formulas (1) or (2) at page 25 of the specification. This reduced hardness, as compared to the use of other conventional polysulfide silanes such as TESPD, needs to be counteracted when manufacturing such articles as tires wherein sufficient hardness is of critical importance for safety and handling characteristics. Accordingly, to take advantage of the superior performance of the mercaptosilanes of the invention as coupling agents, it is also necessary to provide a method for increasing the hardness of the rubber mixture to excel or at least equal the hardness provided by the conventional silanes. While Cruse '036

discloses the silane, what was not disclosed or suggested in Cruse '036 was that a decrease in the hardness was attributable to the use of the subject mercaptosilanes or that such decrease could be remedied by an increase in the amount hardness increasing members. Hence, there is no disclosure or suggestion of the remedy of providing excess hardness increasing member, i.e., 1 to 100 phr above the amount necessary to achieve the equivalent Shore A hardness that would be achieved if one used TESP as the silane. The total amount of hardness increasing member in the mixture is above 100 phr and can range up to about 160 phr. Cruse '036 discloses filler amounts ranging from 5 to 100 phr, and more preferably 25 to 80 phr (page 22, lines 9-10), but provides no suggestion for using greater amounts.

The Office Action states at page 6 that the properties that the silica and carbon black contribute to the composition, i.e., reinforcing and contributing to high modulus, are equivalent to an increase in hardness. However, this is not correct. Referring now to the Table of Example 1 at page 69 of the specification, it can be seen 80 phr of silica, without silane, provides a rubber composition having a relatively high Shore A hardness of 64. The modulus M300% was only 3, and the M300%/M100% ratio was only 1.4. The stress at rupture was 11.7 MPa. Use of the same amount of silica with polysulfide silanes TESPT and TESP as provided rubber mixtures with lower hardness (both 59) but higher values of M300% (14.38 and 9.64, respectively), M300%/M100% (6.5 and 5.6, respectively), and stress at rupture (22.8 and 23.9, respectively). The NXT silane of the invention, with the same 80 phr loading of the silica filler, provided the lowest hardness (53), but high values for M300% (10.2), M300%/M100% (6.0), and the highest

of the measured values for stress at fracture (24.1). As can be seen, modulus and reinforcement properties do not necessarily correspond to hardness.

Referring now to the Table for Example 10 at page 78 of the specification, it can be seen that at 80 phr silica loading the NXT silane provided a rubber having a hardness of 54, whereas TESPd silane, with 80 phr silica loading, provided a rubber with a hardness of 59. However, as this Table clearly demonstrates, when the silica loading is increased to 100 phr the NXT silane provides a rubber with equivalent hardness to the TESPd silane at 80 phr. The effects of higher loadings of silica are shown in Examples 11 and 12. Cruse '036 neither discloses nor suggests such features.

Accordingly, Claims 1 and 42, and all claims depending therefrom, are submitted to be allowable over Cruse '036. Reconsideration and withdrawal of the rejection are respectfully requested.

2. Claims 1-5, 7, 33, 42, and 44 are rejected under 35 USC 102(b) as being anticipated by Guillet et al. US Patent No. 6,005,027 (hereinafter, "Guillet '027"). Guillet '027 discloses a silane having the formula $\text{YRSi(R)}_n(\text{OR})_{3-n}$. Guillet '027 does not disclose or suggest the invention having the features recited in claim 1-42. The remarks above with respect to Cruse '036 apply with equal force herein.

Accordingly, Claims 1 or 42, and all claims depending therefrom, are submitted to be allowable over Guillet '027. Reconsideration and withdrawal of the rejection are respectfully requested.

3. Claim 1-3, 5, 7-8, 17-19, 21, 23-24, 42 and 44 are rejected under 35 USC 102(b) as being anticipated by Waddell et al. WO99/31178 (hereinafter, "Waddell").

Waddell discloses rubber compositions for tires formulated with organofunctional silanes. Waddell does not disclose or suggest the invention having the features recited in independent Claims 1 or 42. For example, Waddell discloses a silica content of from 30 to 80 parts but does not disclose values over 100 phr. The remarks above with respect to Cruse '036 apply with equal force herein. Moreover, Waddell does not disclose or suggest blocked mercaptosilane recited in Claim 3.

Accordingly, Claims 1 and 42 and all claims depending therefrom are submitted to be allowable over Waddell. Reconsideration and withdrawal of the rejection are respectfully requested.

4. Claims 1, 7-8, 33, 42 and 44 are rejected under 35 USC 102 (b) as being anticipated by Stuhldreher EP894819 (hereinafter, "Stuhldreher")

Stuhldreher discloses a method for decreasing dynamic modules without decreasing hardness in silica tread tire compounds by replacing a portion of the silica with kaolin clay.

Stuhldreher does not disclose or suggest the use of blocked or unblocked mercaptosilane, the use of total amounts of hardness increasing member of above 100phr up to about 160phr, or the use of hardness increasing amount of the member above the amount necessary to achieve

equivalent Shore A hardness as compared with the use of bis-(triethoxysilylpropylsulfide) as the silane, as recited in independent Claims 1 and 42.

Accordingly Claims 1 and 42 and all claims depending therefrom are submitted to be allowable over Stuhldreher. Reconsideration and withdrawal of the rejection are respectfully requested.

5. Claims 1-4, 7, 33, 38, 42 and 44 are rejected under 35 USC 102(b) as being anticipated by Ajiro et al. EP97244 (hereinafter, "Ajiro") in view of Hawley's enclosed Chemical Dictionary.

Ajiro is cited for disclosing a rubber composition for a tire including rubber, carbon black, novaloc type phenol resin, and silane coupling agent with silica.

The Office Action states that the properties of the rubber of Ajiro include increased modulus. It is the Examiner's position that reinforcing and increased modulus are equivalent to increased hardness. However, as shown above in connection with Cruse '036, modulus can be improved without an increase in hardness. Hence, one cannot conclude that an increase in modulus is necessarily associated with an increase in hardness.

In any case, Ajiro does not disclose or suggest the use of blocked or unblocked mercaptosilanes, or amounts of hardness increasing members of above 100phr to about 160phr as recited in Claims 1 and 42.

Accordingly, Claims 1 and 42 and all claims depending therefrom are submitted to be allowable over Ajiro. Reconsideration and withdrawal of the rejection are respectfully requested.

6. Claims 1-5, 35-36, 42 and 44 are rejected under 35 USC 102(b) as being anticipated by Aoki et al. JP11-059116. (hereafter, "Aoki")

Aoki discloses a rubber compound for tires containing 40-60 parts by weight of filler and silane coupling agent. Aoki discloses a polysulfide silane but not a blocked or unblocked mercaptosilane as recited in Claims 1 and 42. Aoki does not disclose or suggest the hardness increasing amount of filler or the total amount as recited in Claims 1 and 42.

Accordingly, Claims 1 and 42 and all claims depending therefrom are submitted to be allowable over Aoki. Reconsideration and withdrawal of the rejection are respectfully requested.

7. Claims 1-3, 5, 7-8, 25-27, 29, and 31-32 are rejected under 35 USC 102(b) as being anticipated by Fitzgerald et al. US Patent No. 5,623,028. (hereinafter, "Fitzgerald")

Fitzgerald is cited for disclosing a curable rubber composition with fumed silica; MQ resins and a silanol. However, Fitzgerald does not disclose the use of blocked or unblocked mercaptosilane, the use of hardness increasing amounts of hardness increasing members as recited in Claim 1, or total amounts of over 100phr.

Accordingly, Claim 1 and all claims depending therefrom are submitted to be allowable over Fitzgerald. Reconsideration and withdrawal of the rejection are respectfully requested.

8. Claims 35, 37 and 39-41 are rejected under 35 USC 103(a) as being obvious over Cruse '036 in view of Patitsas et al. WO99/22951. (hereinafter "Patitsas")

Patitsas is cited for disclosing in rubber tire composition with a thermoplastic reinforcing agent with as polyamide, or polypropylene. However, Patitsas does not cure the defects of Cruse '036 as discussed above. Moreover, Patitsas does not employ a silane in conjunction with the thermoplastic filler, which is a required feature of Applicants' claims. One skilled in the art would find no motivation to combine the silane of Cruse '036 with the formulation of Patitsas which excludes silane.

Accordingly, Claims 35, 37 and 39-41 are allowable over Cruse '036 and Patitsas. Reconsideration and withdrawal of the rejection are respectfully requested.

9. Claims 28 and 30 are rejected under 35 USC 103(a) as being obvious over Cruse '036 in view of Fitzgerald and further in view of Hawley's Condensed Chemical Dictionary.

The deficiencies of Cruse '036 are discussed above. The comments of section 1 above are reiterated herein with equal force and effect.

Fitzgerald does not cure the defects of Cruse '036. Fitzgerald does not disclose the use of hardness increasing amounts of hardness increasing members as recited in Claim 1 or total amounts of over 100phr of such members.

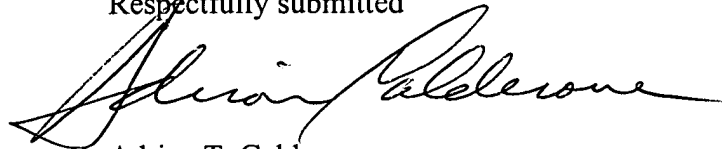
Moreover, there is no motivation provided in either of these references to combine their teachings. MQ resin is described in Fitzgerald as a mold release agent. The fact that a component is a mold release agent has nothing whatever to do with increasing the hardness of a rubber composition. Indeed, neither Cruse '036 nor Fitzgerald say anything about increasing the hardness of silica rubber compositions.

Accordingly, one skilled in the art would find no motivation in either Cruse '036 or Fitzgerald to suggest the combination of their teachings. And even if these references were combined they would not render Claims 28 and 30 obvious because significant features of Applicants' claimed invention are not disclosed or suggested by either of these references, whether taken individually or in combination. In any case the rejection of Claim 28 no longer applies as this claim has been cancelled. Reconsideration and withdrawal of the rejection are respectfully requested.

CONCLUSION

For at least the reasons stated above all of the pending claims are submitted to be in condition for allowance, the same being respectfully requested.

Respectfully submitted

A handwritten signature in black ink, appearing to read "Adrian T. Calderone", written over a horizontal line.

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AMENDMENTS TO THE DRAWINGS

The attached six sheets of drawings include changes to Figs. 1-6. These sheets replace to original Figs. 1-6. In all of the drawings the caption Temp (°C) is changed to Temp (°C).

Attachments: Six Replacement Sheets for Figs. 1 to 6.